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EGG ULTRASTRUCTURE AND DESCRIPTIONS OF NYMPHS OF *PELOCORIS POEYI* (GUÉRIN MÉNEVILLE) (HEMIPTERA: NAUCORIDAE)

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Abstract.—Adults and first through fifth instars of *Pelocoris poeyi* were collected from two localities in Amazonian Ecuador. Immatures occurred syntopically with adults and were found among vegetation in standing water. The existence of five nymphal instars was confirmed with Discriminant Function Analysis based on a suite of external mensural characters. Eggs have two partially fused, coiled micropyles at the anterior pole. First instars are impunctate, whereas the remaining instars are punctate in discrete patterns. Second through fifth instars are separable based on relative length of the mesonotal wingpad compared with the exposed part of the metanotal lateral margin. Scanning electron micrographs of eggs are presented and all immature stages described and illustrated.

The genus *Pelocoris* (Hemiptera: Naucoridae) is restricted to the New World and comprises 17 species (La Rivers, 1971, 1974, 1976). Of these, the immature stages have been described for only *P. f. femoratus* Palisot de Beauvois (Torre Bueno, 1903; Hungerford, 1920; McPherson et al., 1987). *Pelocoris poeyi* (Guérin Méneville) was described in 1835 via an iconograph; the accompanying text was published in 1844. More recently, Nieser (1975) provided a comparative description of *P. poeyi* and with it synonymized *P. convexus* Nieser.

The currently known range of *P. poeyi* is throughout much of the Caribbean Islands and tropical South America. It has been reported specifically from Aruba, Barbuda, Curaçao, Guadeloupe, Iles-des-Saintes, Marie-Galante, Puerto Rico, St. Croix, and Trinidad (Nieser, 1969), Brazil, Guyana, and Suriname (Nieser, 1975), Cuba (Nieser, 1977), and Ecuador (Sites, 1990). Only several ecological notes have been published for *P. poeyi*; Nieser (1975) reported that in Suriname it occurs in saline water and is abundant in stagnant water with aquatic vegetation. Sites (1990) reported that in Ecuador, *P. poeyi* occurs with other aquatic Hemiptera, including *Belostoma plebejum* (Stål) (Belostomatidae), *Heterocorixa w. wrighti* Hungerford (Corixidae), and *Notonecta pulchra* Hungerford (Notonectidae), and that nymphs are syntopic with adults in springs and swamps. Scanning electron micrographs of egg ultrastructure and descriptions of all immature stages of *P. poeyi* from Ecuador are presented herein.

MATERIALS AND METHODS

Adults and first through fifth instars of *P. poeyi* were collected from two localities in Napo Province, Ecuador [see Sites (1990) for precise localities and descriptions of habitats]. Submergent and emergent vegetation in swampy situations and a spring fed pool were swept with an aquatic D-net; adults and all nymphal stages were collected from the same habitats. All specimens were fixed in 70% isopropyl alcohol for ca. 2 weeks, then preserved in 70% ethyl alcohol. Voucher specimens are housed

in the Enns Entomological Collection, University of Missouri. Eggs were obtained by dissecting females preserved in alcohol. Only eggs contained in the common oviduct or vagina were used for scanning electron microscopy and measurements. All measurements are based on 10 individuals of each stage. Linear measurements [mm ($\bar{y} \pm$ SE)] were made with an ocular micrometer.

DESCRIPTIONS OF IMMATURES

Egg (Fig. 1). Length, 1.38 ± 0.01 mm; width, 0.67 ± 0.01 mm. Egg elongate and slightly reniform with rounded ends (Fig. 1A); color creamy white; polygonal reticulation pattern on surface generally pentagonal or hexagonal (Fig. 1B); reticulation composed of a series of depressed lines; each polygon with 10–20 slightly-domed pore canals within (Fig. 1C); anterior pole with micropyles situated among polygons with raised ridges, with pore canals poorly developed or absent (Fig. 1D); two partially fused, coiled micropyles at anterior pole (Fig. 1E); micropyles arising from single, twisted stalk (Fig. 1F).

Nymphs. The only congener of *P. poeyi* for which the instar number is known is *P. femoratus* Palisot de Beauvois with five nymphal instars (Torre Bueno, 1903). Under the presumption that *P. poeyi* also has five instars, Discriminant Function Analysis (DFA) was performed on the raw data summarized in Table 1 to determine if these data completely separate into five groups. The DFA was significant ($\chi^2 = 396.8$, df = 72, $P \ll 0.001$) and the corresponding classification phase of DFA correctly assigned 100% of the cases to the appropriate instar. Thus, even without data on rearing, *P. poeyi* also appears to have five instars.

The first instar is described in detail and only changes in subsequent instars are described. Patterns and extent of maculation are variable among individuals. Length is measured from tip of tylus to tip of abdomen; width is measured across metathorax. Because individual naucorid size varies with environmental temperature during development (see Sites & Nichols, 1990), the mean body/head dorsal surface area ratio is given for each instar as measure of allometric growth, and was calculated using a digitizer (Macintizer, GTCO Corp.) and camera lucida. The digitized ratios and additional measurements are given in Table 1.

First instar (Fig. 2A). Body elongate, parallel-sided, greatest width at metathorax; general appearance dorsally and ventromedially convex, ventrolaterally concave; posterior end slightly produced to a point; dorsally dark brown with yellowish brown areas, ventrally yellowish brown.

Head broadly triangular; anterior margin convex, continuous with lateral margins of prothorax; posterior margin lobate and deeply convex medially. Head dark brown with yellowish brown areas along mesal margins of compound eyes dorsally; yellowish brown ventrally. Compound eye red, synthlipsis (measured at anterior margin of eyes) ca. 3.5 × width of one eye. Antenna three-segmented, segment one yellowish brown, segments two and three dark brown; segment two ca. 2.0 × length of segment one and ca. 0.7 × length of segment three. Beak dark brown, elongate-conical, three-segmented with segment one concealed beneath labrum, overall length ca. 1.4 × width at base, segment two ca. 3.0 × length of segment one and 1.2 × length of segment three.

Nota dark brown with yellowish brown areas behind compound eyes and at pos-

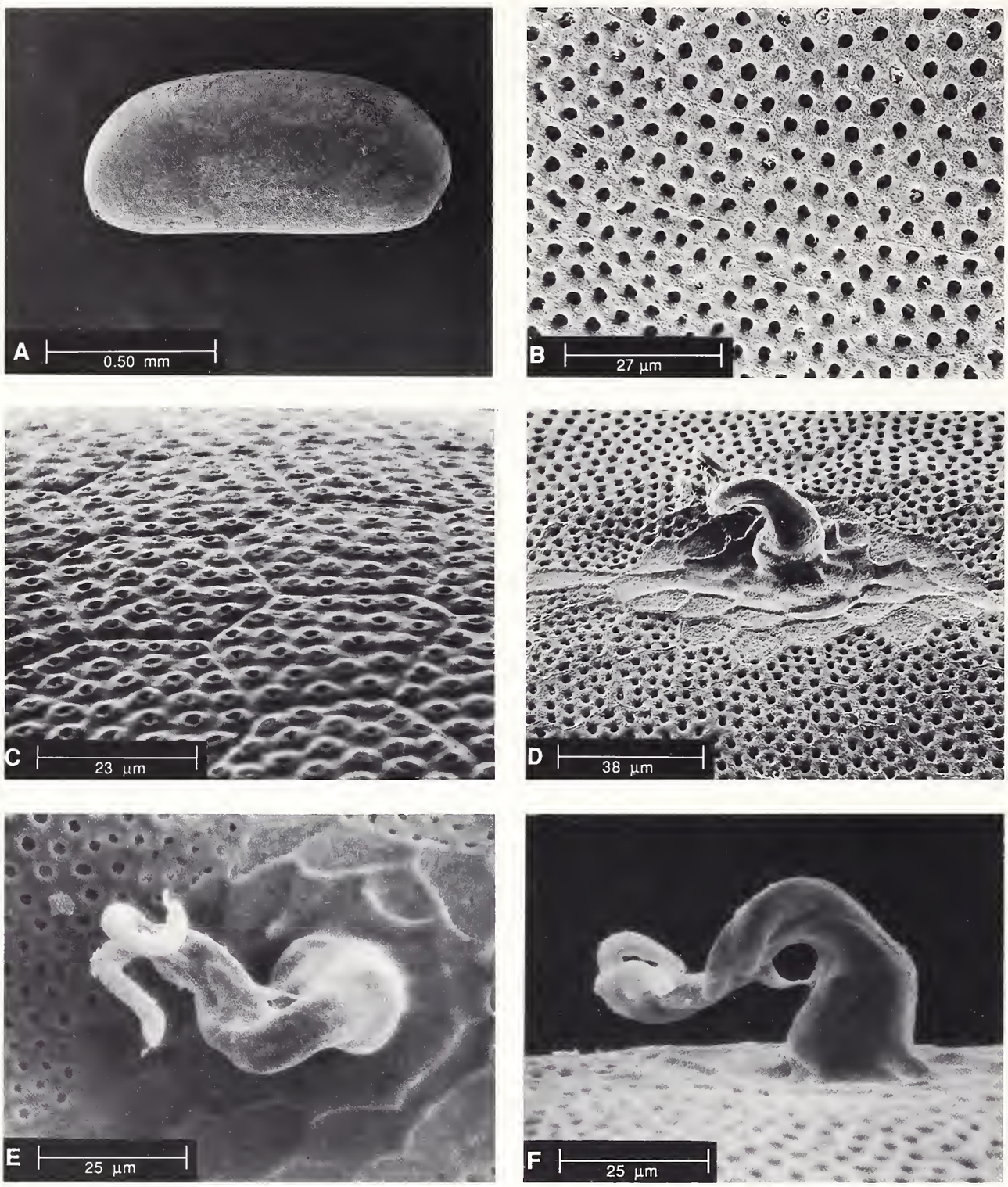

Fig. 1. Scanning electron micrographs of *Pelocoris poeyi*. A. Intact egg. B. Polygonal reticulation pattern of chorion and pore canals. C. Domed pore canals and depressed lines forming reticulation. D. Anterior pole with micropyles and modified chorionic sculpturing. E. Paired, coiled micropyles (end view). F. Micropyles arising from single, twisted stalk (lateral view).

terolateral corners of each notum; mid-dorsal longitudinal suture from anterior margin of pronotum to ¾ length of metanotum. Pronotum with anterior margin lobate and deeply concave medially to abut posterior margin of head; posterior margin nearly straight; pronotum overlaps 20–40% of mesonotum. Mesonotum shortest of nota, ca. 0.9 × length of pronotum at midline; posterior margin convex laterally and

Table 1. Descriptive measurements (mm)[a] and body/head ratios of *Pelocoris poeyi* instars.

Character[b]	Nymph				
	1st instar	2nd instar	3rd instar	4th instar	5th instar
Body/head area[c]	7.19 ± 0.14	8.66 ± 0.29	10.28 ± 0.21	12.03 ± 0.34	12.64 ± 0.22
Body length	2.26 ± 0.02	3.01 ± 0.02	4.16 ± 0.06	5.55 ± 0.05	7.55 ± 0.13
Body width	1.43 ± 0.02	1.99 ± 0.01	2.75 ± 0.03	3.70 ± 0.04	5.03 ± 0.08
Head length	0.64 ± 0.01	0.80 ± 0.01	1.02 ± 0.02	1.26 ± 0.01	1.53 ± 0.03
Head width	0.86 ± 0.02	1.16 ± 0.01	1.55 ± 0.01	2.01 ± 0.02	2.64 ± 0.04
Synthlipsis	0.42 ± 0.01	0.54 ± 0.01	0.67 ± 0.01	0.80 ± 0.02	0.96 ± 0.04
Pronotal length	0.23 ± 0.00	0.40 ± 0.00	0.60 ± 0.01	0.89 ± 0.01	1.33 ± 0.02
Mesonotal length	0.20 ± 0.01	0.37 ± 0.01	0.56 ± 0.01	0.84 ± 0.02	1.23 ± 0.03
Metanotal length	0.29 ± 0.01	0.40 ± 0.00	0.56 ± 0.01	0.70 ± 0.01	0.96 ± 0.02
Leg lengths:					
Profemur	0.58 ± 0.01	0.75 ± 0.00	1.02 ± 0.01	1.33 ± 0.01	1.80 ± 0.04
Protibia	0.36 ± 0.01	0.48 ± 0.00	0.68 ± 0.01	0.90 ± 0.01	1.27 ± 0.03
Protarsus	0.21 ± 0.00	0.24 ± 0.00	0.28 ± 0.00	0.30 ± 0.01	0.36 ± 0.01
Mesofemur	0.50 ± 0.00	0.68 ± 0.00	0.89 ± 0.01	1.20 ± 0.01	1.63 ± 0.04
Mesotibia	0.39 ± 0.00	0.51 ± 0.01	0.69 ± 0.01	0.92 ± 0.01	1.26 ± 0.04
Mesotarsus	0.24 ± 0.00	0.29 ± 0.00	0.36 ± 0.00	0.46 ± 0.01	0.59 ± 0.01
Metafemur	0.62 ± 0.00	0.87 ± 0.00	1.17 ± 0.02	1.56 ± 0.01	2.12 ± 0.04
Metatibia	0.64 ± 0.01	0.87 ± 0.00	1.18 ± 0.02	1.55 ± 0.01	2.13 ± 0.06
Metatarsus	0.36 ± 0.01	0.45 ± 0.00	0.57 ± 0.01	0.72 ± 0.01	0.96 ± 0.02

[a] $\bar{y}$ ± SE; SE values less than 0.005 are listed as 0.00; measurements are based on 10 individuals.
[b] Synthlipsis measured at anterior margin, leg segments at longest points, other lengths at midline, widths at greatest distance.
[c] Ratio is mean body/head dorsal surface area and was calculated using digitized areas.

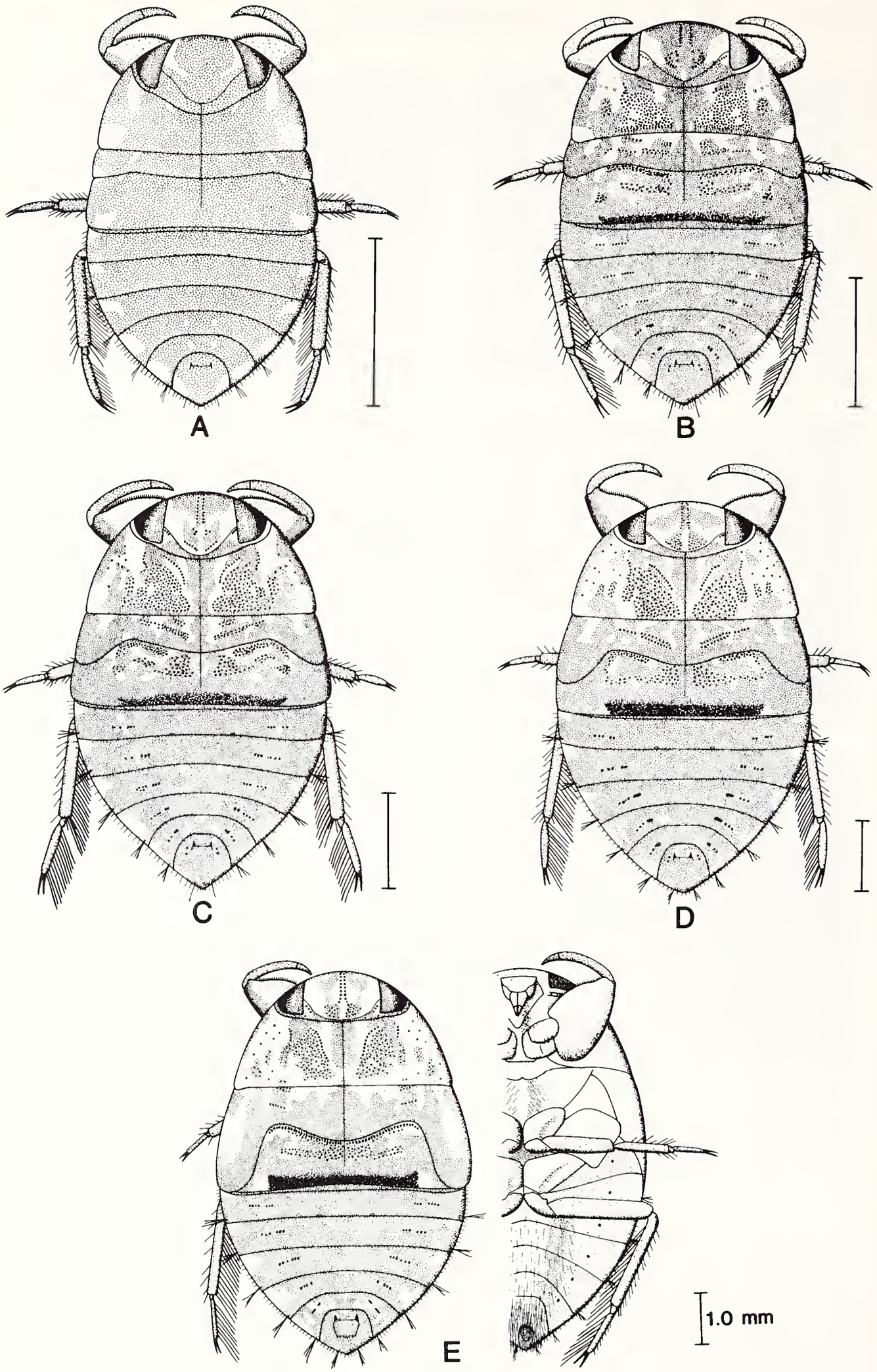

Fig. 2. Nymphal instars of *Pelocoris poeyi*. A. First instar. B. Second instar. C. Third instar. D. Fourth instar. E. Fifth instar.

slightly convex medially. Metanotum longest of nota, ca. 1.4 × length of mesonotum at midline; posterior margin shallowly inverted-V shaped. Mesonotal wing pads evident, metanotal wing pads absent. Metanotum completely overlaps abdominal tergum I and 70–90% of tergum II.

Prothoracic leg retentorial (see Sites and Nichols, 1990); tibia and tarsus dark brown and femur light brown with dark brown dorsal margin, trochanter dark brown ventrally, and coxa light brown. Procoxa ca. 1.9 × length of trochanter and ca. 0.7 × length of femur. Profemur laterally compressed; two rows of pegs directed ventrolaterally and ventromedially with row of slender setae between, pegs gradually shortening distally so that distal pegs are 0.5–0.2 × length of basal pegs; row of stout setae at base on lateral surface. Protibia and protarsus with sulcus extending length of ventral surface, sulcus with row of spatulate setae from near base of tibia to basal ⅓ of tarsus; femoral pegs embrace sides of tibia and tarsus when appressed; tarsus one-segmented with a single terminal claw.

Meso- and metathoracic legs dark brown; all segments of metathoracic leg longer than corresponding segments of mesothoracic leg. Mesocoxa conical, ca. 2 × length of semicircular trochanter and 0.7 × length of femur. Meso- and metacoxa with 2–3 short spines along ventral ridge. Mesofemur with 3 rows of pegs: 3–5 posteroventral, 9–11 posterodorsal, and 9–11 recurved pegs on anterior margin; anterior and posteroventral peg numbers exclude contiguous apical groups; pegs on posteroventral and anterior margins gradually lengthening distally so that distal pegs are spine-like; mesofemur with row of 4 stout setae at posteroventral apex and 2 at anteroventral apex; mesofemur ca. 1.2 × length of mesotibia. Mesotibia with four rows of stout spines (two ventral, one anterior, one posterior). Mesotarsus two-segmented, first segment 0.3 × length of second and lobed ¾ its length under second, second segment with two rows of spines. Claws paired and equal, 0.4 × length of tarsus. Metacoxa and trochanter resembling those of mesothoracic leg in shape and proportions. Metafemur with 4 rows of pegs: 14–16 posteroventral, 7–9 posterodorsal paralleled by a row of smaller pegs that curve anteriorly near junction with trochanter, 11–13 anterior; anterior and posteroventral peg numbers exclude contiguous apical groups; metafemur subequal in length to metatibia. Metatarsus with first segment ca. 0.2 × length of second, second segment with two rows of spines. Natatorial hairs sparse on mesotibia and tarsus, abundant on metatibia and tarsus.

Abdomen dorsally dark brown with yellowish brown area at anterolateral corner of each tergum and on each side of the midline of terga III–VII (the latter are more strongly developed posteriorly, and tend to become reduced or absent anteriorly); ventrally yellowish brown with dark brown sternum IX; lateral margins of segments III–VIII finely serrate; ventrally finely setose with middle ⅓ convex and covered with long setae, glabrous band on lateral $\frac{1}{10}$ of each sternum; spiracles present ¼ distance from lateral margin to midline on segments I–VIII, those on segment I concealed in posterolateral corner of the metacoxal cavity; spiracles on segment I elongate-oval, those on segments II–VIII circular. Paired ostioles of scent glands dorsally at posterior margin of tergum III. Two transverse, paired series of punctures on each of terga III–VII.

Second instar (Fig. 2B). Coloration lighter, more distinctly patterned with brown and yellowish brown. Dorsal punctation in distinct patterns. Posterior margin of head less deeply lobed into anterior margin of pronotum. Antenna with segment two ca.

2.5 × length of segment one and ca. 0.6 × length of segment three. Nota brown with yellowish brown mottled pattern; punctation dark brown; dark brown transverse stripe where posterior ⅓ of metanotum overlaps abdominal tergum II. Lengths of pronotum and metanotum subequal at midline and 1.1 × length of mesonotum. Profemur with dense setation ventrally; only one row of pegs. Mesofemur peg numbers: 2–4 posteroventral, 13–17 posterodorsal, 8–10 recurved pegs on anterior margin; mesofemur with row of 7 stout setae at posteroventral apex and 6 at anteroventral apex. Mesotibia with posteroventral row of spines alternately a single large spine with doubled smaller spines; apically with two rows of 4 stout spines ventrally. Metafemur peg numbers: 18–20 posteroventral, 9–11 posterodorsal, 12–14 anterior. Metatibia with two rows of 4 stout spines ventrally. Abdomen with paired series of dark brown punctures ⅓–½ distance from lateral margin to midline on terga III–VII. Sterna V–VIII brown with yellowish brown areas at anterolateral corners and on each side of midline at posterior margins.

Third instar (Fig. 2C). Body shape ovate. Head with posterior margin less deeply lobate into anterior margin of pronotum; color yellowish brown with brown along posterior margin and in anchor shape at midline; brown coloration coincident with punctation. Antenna with segment two ca. 3.0 × length of segment one and ca. 0.6 × length of segment three. Pro-, meso-, and metanotum subequal in length at midline. Mesonotal wing pad length ca. 0.7 × length of exposed part of lateral margin of metanotum. Mesofemur peg numbers: 5–7 posteroventral, 20–22 posterodorsal, 14–16 recurved pegs on anterior margin; mesofemur with row of 9 stout setae at posteroventral apex and 7 at anteroventral apex. Mesotibia with doubled posteroventral spines occasionally tripled; apically with rows of 4 and 5 stout spines ventrally. Metafemur peg numbers: 30–35 posteroventral, 18–21 posterodorsal, 15–18 anterior. Metatibia with two rows of 5 stout spines ventrally. Abdominal terga with yellowish brown areas more pronounced and at the anterior midline and laterally near each punctation series; sterna with conspicuous darkening along midline.

Fourth instar (Fig. 2D). Antenna with segment two ca. 3.5 × length of segment one and ca. 0.5 × length of segment three. Pronotum length subequal to that of mesonotum along midline, and ca. 1.2 × that of metanotum. Profemur with fewer than 10 basal pegs on ventral margin; usually punctate on lateral surface. Mesonotal wing pad length subequal to that of exposed part of lateral margin of metanotum. Mesofemur peg numbers: 7 pegs posteroventral, 28 posterodorsal, 13–15 recurved pegs on anterior margin; mesofemur with row of 12 stout setae at posteroventral apex and 9 at anteroventral apex. Metafemur peg numbers: 40–45 posteroventral, 45–48 posterodorsal, 25–28 anterior. Metatibia with two rows of 6 stout spines ventrally.

Fifth instar (Fig. 2E). Antenna with segment two ca. 3.0 × length of segment one and ca. 0.5 × length of segment three. Mesonotum 0.9 × length of pronotum and 1.3 × that of metanotum at midline. Mesonotal wing pad completely overlaps lateral margin of metanotum and often anterolateral corners of abdominal terga II and III. Mesofemur peg numbers: 8–10 posteroventral, 48–55 posterodorsal, 18–22 recurved pegs along anterior margin; mesofemur with row of 10 stout setae at posteroventral apex and 9 at anteroventral apex. Mesotibia with posteroventral spines alternately one large with tripled or quadrupled smaller spines; apically with rows of 6 and 7

stout spines ventrally. Metafemur peg numbers: 49–52 posteroventral, 44–48 posterodorsal, 26–27 anterior. Metatibia with two rows of 7 stout spines ventrally.

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